DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-5, 7-14 filed on 03/2/2010 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Claims 1-4, 5, 7-9, 13-14 are objected to because of the following informalities:

Claim 1 (line 9), "a video voltage" should be changed to --the video voltage--.

Claim 5 (lines 3-4), "a voltage" should be changed to --the voltage--.

Claim 13 (line 4), "each video voltage" should be changed to --the video voltage--.

Claims 2-4 are objected as being dependent from claim 1.

Claims 7-9 are objected as being dependent from claim 5.

Claim 14 is objected as being dependent from claim 13.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-5, 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borg et al. (US 6,476,864) in view of Henderson (US 7,280,140) further in view of Morse et al. (US 4,786,831).

Regarding claim 1, Borg et al. discloses an active pixel sensor array sampling system comprising:

a video circuit (column amplifiers 230, figure 3A, column 6, lines 17-60) that generates a video voltage from each pixel in a row of pixels;

a reference circuit (reference column amplifier 240, which generates a unique reference voltage associated with each pixel 10 in each row of active pixel sensor array 280 when the timing controller select which row to read out. It is noted that the reference column amplifier 240 is associated to pixels 10 of active pixel sensor array 280, figure 3A, column 6, lines 17-60) that generates a unique reference voltage associated with each pixel in the row of pixels;

wherein the video circuit comprises a plurality of video amplifiers (column amplifiers 230, figure 3A, column 6, lines 17-60), each video amplifier being associated with a respective pixel in the row of pixels (each amplifier 230 associated with each pixel 10 on each column line 38, figure 3A, column 6, lines 17-60),

the video amplifiers sample in series, one at a time, a video voltage from each pixel in the row of pixels (figure 3A, column 6, lines 17-60),

the reference circuit comprises a single reference amplifier (reference column amplifier 240, figure 3A, column 6, lines 17-60) associated with all of the pixels in the row of pixels,

the reference amplifier samples the unique reference voltage for each pixel in the row of pixels (column 4, lines 15-29).

Borg et al. fails to specifically disclose the reference circuit that generates a respective unique reference voltage, and the single reference amplifier separately samples in series, one at a time, the respective unique reference voltage for each pixel in the row of pixels as each pixel in the row of pixels is sampled by a respective one of the plurality of video amplifiers; a differential amplifier receives both, the video voltage and the respective unique reference voltage, sampled in series, from each pixel in the row of pixels, and provides, in series, a corresponding differential voltage output.

However, Henderson discloses an image sensor, in which signal REFSMP and CDSSIG are pulsed simultaneously to sample the black reference voltage Bblkref as Vblk and the pixel output voltage as Vsig for each pixel 10 (figures 1-2, column 2, lines 15-55); Henderson also disclose comparator 16 (differential amplifier) for outputting the difference between sampled values as a reset-related value foe each pixel (differential voltage output), figures 1-2, column 1, lines 50-60; column 2, lines 15-55.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Borg et al. by the teaching of Henderson in order to allow a reduction in the size of frame buffer in a double read image sensor system (column 1, lines 29-30).

Borg et al. and Henderson fail to specifically disclose each video amplifier includes a single capacitor having a terminal switched between a respective column input and an output of the video amplifier.

However, Morse et al. teaches an amplifier circuit 12, which comprises a coupling capacitor 14 and a capacitor reset switch 24; when the capacitor reset switch 24 is closed in a

first time period, the capacitor 14 is coupled between the input of the amplifier 12 and the output 22 of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25), when the capacitor reset switch 24 is opened in a second time period, the capacitor 14 is coupled between the column input node 20 and the input of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Borg et al. and Henderson by the teaching of Morse et al. in order to obtain an amplifier circuit for infrared detectors in which detector noise is reduced and detector responsivity uniformity is improved (column 2, lines 25-29).

Regarding claim 2, Borg et al. discloses wherein each of the video amplifiers is associated with all of the pixels in a respective column of pixels (each amplifier 230 associated with each pixel 10 on each column line 38, figure 3A, column 6, lines 17-60).

Regarding claim 3, Henderson disclose the differential amplifier (comparator 16, figure 1, column 1, lines 50-60; column 2, lines 15-24) that generates a differential voltage responsive to the video voltage and the respective unique reference voltage associated with each pixel in the row of pixels.

Regarding claim 4, Borg et al. discloses the single reference amplifier has an output continuously coupled to the differential amplifier during reading of the video voltage of each of the video amplifiers (figures 3A, 4, column 6, lines 17-60).

Regarding claim 5, Borg et al. discloses an active pixel sensor array sampling circuit that samples a voltage on each one of a plurality of pixels, the circuit comprising:

a plurality of video circuits (column amplifiers 230, figure 3A, column 6, lines 17-60), each video circuit generating a video voltage related to a voltage on a respective one of the pixels as its respective pixel is sampled;

a reference circuit (reference column amplifier 240, figure 3A, column 4, lines 15-29, column 6, lines 17-60) that separately samples a unique reference voltage as each pixel in the plurality of pixels is sampled by the video circuits;

wherein the pixels are arranged in columns and rows, wherein the reference circuit is associated with all of the pixels of each row of pixels, and the reference circuit samples a unique reference voltage as each video voltage of each pixel in a row of pixels is sampled (figure 3A, column 4, lines 15-29, column 6, lines 17-60).

Borg et al. fails to specifically disclose the reference circuit that samples a respective unique reference voltage, and the reference circuit samples the respective unique reference voltage as each video voltage of each pixel in a row of pixels is sampled; a differential amplifier receives both, the video voltage and the respective unique reference voltage, sampled in series, from each pixel in the row of pixels, and provides, in series, a corresponding differential voltage output.

However, Henderson discloses an image sensor, in which signal REFSMP and CDSSIG are pulsed simultaneously to sample the black reference voltage Bblkref as Vblk and the pixel output voltage as Vsig for each pixel 10 (figures 1-2, column 2, lines 15-55); Henderson also disclose comparator 16 (differential amplifier) for outputting the difference between sampled

values as a reset-related value foe each pixel (differential voltage output), figures 1-2, column 1, lines 50-60; column 2, lines 15-55.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Borg et al. by the teaching of Henderson in order to allow a reduction in the size of frame buffer in a double read image sensor system (column 1, lines 29-30).

Borg et al. and Henderson fail to specifically disclose each video circuit including a video amplifier having a single capacitor with a terminal switched between a respective column input and an output of the video amplifier.

However, Morse et al. teaches an amplifier circuit 12, which comprises a coupling capacitor 14 and a capacitor reset switch 24; when the capacitor reset switch 24 is closed in a first time period, the capacitor 14 is coupled between the input of the amplifier 12 and the output 22 of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25), when the capacitor reset switch 24 is opened in a second time period, the capacitor 14 is coupled between the column input node 20 and the input of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Borg et al. and Henderson by the teaching of Morse et al. in order to obtain an amplifier circuit for infrared detectors in which detector noise is reduced and detector responsivity uniformity is improved (column 2, lines 25-29).

Regarding claim 7, Henderson disclose the differential amplifier (comparator 16, figure 1, column 1, lines 50-60; column 2, lines 15-24) that provides the differential voltage output

representing a difference between each sampled video voltage and a corresponding sampled respective unique reference voltage.

Regarding claim 8, Borg et al. discloses wherein the reference circuit includes a reference amplifier that has an output continuously coupled to the differential amplifier during the sampling of the video voltages for each row of pixels (figures 3A, 4, column 6, lines 17-60).

Regarding claim 9, Borg et al. discloses wherein each video amplifier is associated with all of the pixels of a respective column of pixels (each amplifier 230 associated with each pixel 10 on each column line 38, figure 3A, column 6, lines 17-60).

Regarding claim 10, Borg et al. discloses an integrated circuit including an active pixel sensor array sampling system comprising:

a plurality of video circuits, each video circuit sampling a video voltage from a respective pixel in a row of pixels (column amplifiers 230, figure 3A, column 4, lines 15-29, column 6, lines 17-60);

a reference circuit (reference column amplifier 240, figure 3A, column 4, lines 15-29, column 6, lines 17-60) that separately samples a unique reference voltage for each pixel in a row of pixels, as each video voltage is sampled by a respective one of the video circuits.

Borg et al. fails to specifically disclose a reference circuit that samples a respective unique reference voltage for each pixel in a row of pixels, as each video voltage is sampled by a respective one of the video circuits; a differential amplifier receives both, the video voltage and

the respective unique reference voltage, sampled in series, from each pixel in the row of pixels, and provides, in series, a corresponding differential voltage output.

However, Henderson discloses an image sensor, in which signal REFSMP and CDSSIG are pulsed simultaneously to sample the black reference voltage Bblkref as Vblk and the pixel output voltage as Vsig for each pixel 10 (figures 1-2, column 2, lines 15-55); Henderson also disclose comparator 16 (differential amplifier) for outputting the difference between sampled values as a reset-related value foe each pixel (differential voltage output), figures 1-2, column 1, lines 50-60; column 2, lines 15-55.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Borg et al. by the teaching of Henderson in order to allow a reduction in the size of frame buffer in a double read image sensor system (column 1, lines 29-30).

Borg et al. and Henderson fail to specifically disclose wherein each video circuit includes a video amplifier having a single capacitor with a terminal switched between a respective column input and an output of the video amplifier.

However, Morse et al. teaches an amplifier circuit 12, which comprises a coupling capacitor 14 and a capacitor reset switch 24; when the capacitor reset switch 24 is closed in a first time period, the capacitor 14 is coupled between the input of the amplifier 12 and the output 22 of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25), when the capacitor reset switch 24 is opened in a second time period, the capacitor 14 is coupled between the column input node 20 and the input of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to modify the device in Borg et al. and Henderson by the teaching of Morse et al. in order to obtain an amplifier circuit for infrared detectors in which detector noise is reduced and detector responsivity uniformity is improved (column 2, lines 25-29).

Regarding claim 11, Borg et al. discloses a differential amplifier (comparator 16, figure 1, column 1, lines 50-60; column 2, lines 15-24) generates a differential voltage responsive to each read video voltage and its respective sampled unique reference voltage.

Regarding claim 12, Borg et al. discloses wherein the pixels are arranged in columns and rows and wherein each video circuit is associated with all of the pixels of a respective column of pixels (figure 3A).

5. Claims 13-14 are rejected under 35 U.S.C.103(a) as being unpatentable over Henderson (US 7,280,140) in view of Morse et al. (US 4,786,831).

Regarding claim 13, Henderson discloses a method of sampling a group of active pixels comprising:

sampling a voltage on each pixel in a row of pixels to generate a video voltage for each pixel in the row of pixels (figures 1-2, column 2, lines 15-55);

serially sampling each video voltage (signal CDSSIG pulse to sample the pixel output voltage as Vsig, figures 1-2, column 2, lines 15-55);

sampling a unique reference voltage, respectively, for each pixel in the row of pixels as each respective video voltage is sampled (signal REFSMPL pulse to sample the black reference voltage Vblkref as Vblk for each pixel 10, figures 1, 2, column 2, lines 25-55);

receiving, by a differential amplifier (comparator 16, figure 1, column 1, lines 50-60; column 2, lines 15-24) both, the video voltage and the respective unique reference voltage, sampled in series, from each pixel in the row of pixels, and providing, in series, a corresponding differential voltage output.

Henderson fails to specifically disclose wherein the serial sampling of the video voltage by the video amplifier includes switching a terminal of a single capacitor between a respective column input and an output of the video amplifier.

However, Morse et al. teaches an amplifier circuit 12, which comprises a coupling capacitor 14 and a capacitor reset switch 24; when the capacitor reset switch 24 is closed in a first time period, the capacitor 14 is coupled between the input of the amplifier 12 and the output 22 of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25), when the capacitor reset switch 24 is opened in a second time period, the capacitor 14 is coupled between the column input node 20 and the input of the amplifier 12 (figure 3, column 2, line 53 - column 3, line 25). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Henderson by the teaching of Morse et al. in order to obtain an amplifier circuit for infrared detectors in which detector noise is reduced and detector responsivity uniformity is improved (column 2, lines 25-29).

Regarding claim14, Henderson discloses generating the differential voltage output from each sampled video voltage and its associated sampled unique reference voltage (figures 1-2, column 1, lines 50-60); column 2, lines 15-55).

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUONG T. NGUYEN whose telephone number is (571) 272-7315. The examiner can normally be reached on 7:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID L. OMETZ can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LUONG T NGUYEN/
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06/14/10